Space Weather Technical Forecast

Issued on Saturday, 06 August 2022 at 01:13 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/Minor Storms possible due to high speed stream activity. Slight chance of M-class flares. Chance of Active (1e8 integrated pfu) fluence by Days 3 and 4.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low over the past 24 hours with isolated C-class flares. There are currently five numbered regions on the disc, most of which are small, weak and appear magnetically stable. The largest region on the visible disc continues to be AR3068, but this has shown only minor activity so far. A possible CME was observed from a flare at 05/0644UTC from one of the regions in the southwest quadrant. Analysis of this event is difficult due to lack of imagery, but it is currently considered unlikely to be Earth directed.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, has been slightly elevated levels under a waning high speed stream from coronal hole 07. Wind speeds have varied between 370-430 km/s. Density was mostly near average throughout. The total IMF, Bt, was weak, with a brief increase to moderate around 05/0045UTC, peaking at 9nT. The north-south component, Bz, fluctuated mostly weakly between +5/-8 nT. The Phi angle was mostly negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 0-3).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16 was at background levels. The high energy electron flux (greater than 2 MeV) was at mostly background levels. Electron fluence was well below the Active (1e8 integrated pfu) threshold and showed a drop from 05/1200 UTC. Observed fluence was 1.73e6 integrated pfu at 06/0000 UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Low solar activity is likely to continue at first, with a slight chance of an M-class flare. Potential new regions may rotate onto the disc in the next couple of days, increasing flare probabilities slightly, although AR3068 will rotate off on Day 4 (09 Aug).

Solar Wind / Geomagnetic Activity: The CME observed from one of the regions in the southwest quadrant is currently considered unlikely to be Earth directed. Wind speeds are now just below 400 km/s. Later on Day 1 (06 Aug) a new HSS is expected to arrive, from CH09/+, with wind speeds of 500-550 km/s likely. Wind speeds from this feature are expected to slowly ease through Day 3 (08 Aug), before a further increase is likely on Day 4 (09 Aug) from CH10/+. Geomagnetic activity should remain Quiet to Unsettled at first, increasing Unsettled to Active later Day 1 and into Day 2, with a slight chance of isolated G1/Minor Storm intervals occurring. Activity should decline through Days 2 and 3 to mainly Quiet, before another increase on Day 4 with a chance of G1 intervals once again.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at background levels. The high energy electron flux (greater than 2 MeV) may increase through the period to reach high levels at the diurnal maxima by Days 3 and 4 (08-09 Aug). The corresponding 24 hour fluence is likely to show an increasing trend through Days 3

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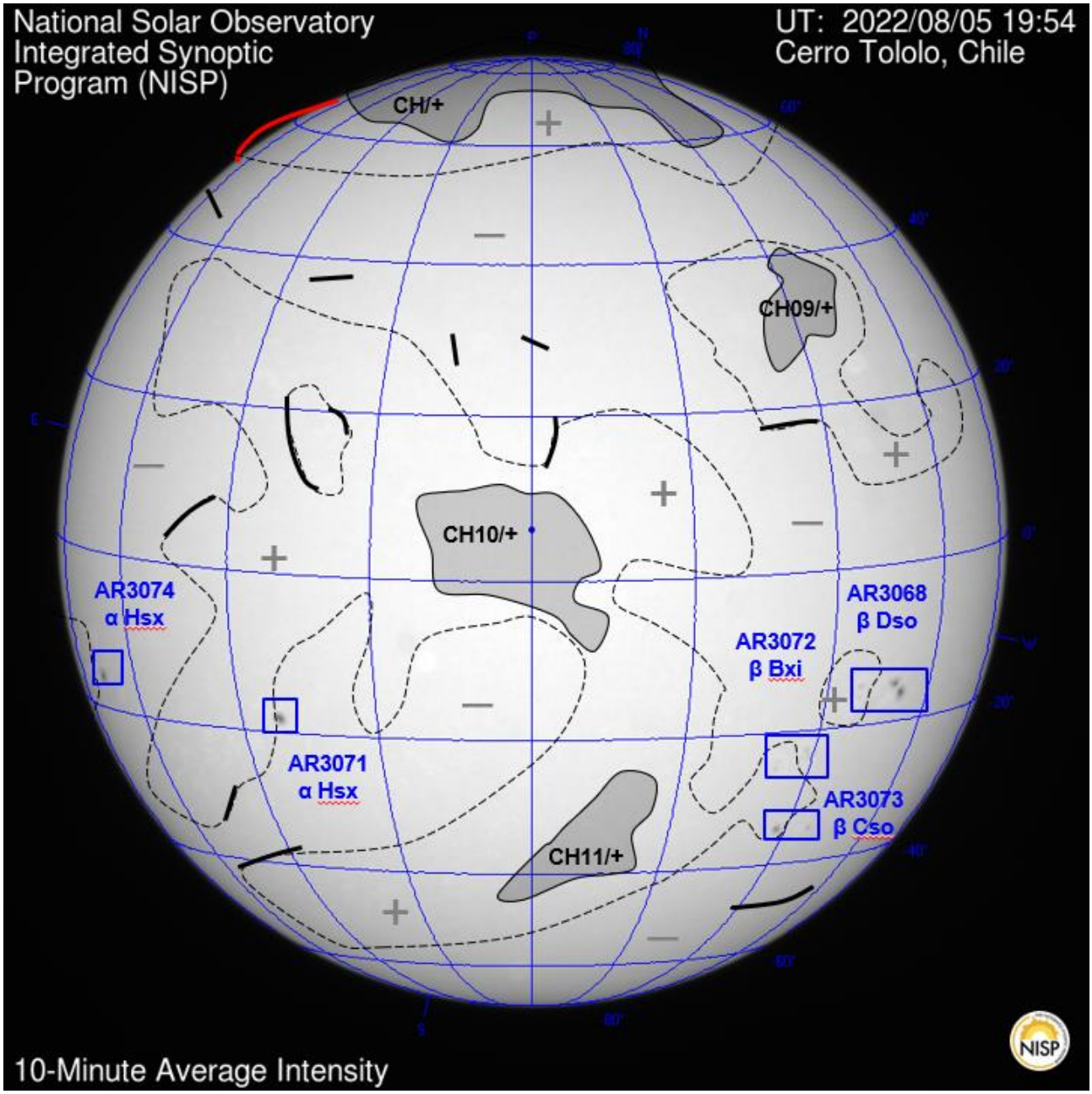
and 4 with a chance of reaching Active (1e8 integrated pfu) levels at this time.

Figure 1. Solar Analysis Valid 05/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A CME was observed associated with a flare at 05/0644UTC from one of the regions in the southwest quadrant. Analysis of this event is difficult due to lack of imagery, but it is currently considered unlikely to be Earth directed. Earth is currently gradually exiting the High Speed Stream of CH07/-, with wind speeds now just below 400 km/s. Then from later on Day 1 (06 Aug) a new HSS is expected to arrive, from CH09/+. Although this feature appears weak in imagery, recent data from STEREO-A indicates that solar wind speeds of 500-550 km/s are likely, following a potentially reasonably significant CIR (Co-rotating interaction region). Wind speeds from this feature are expected to slowly ease through Day 3 (08 Aug), before a further increase is likely on Day 4 (09 Aug) from CH10/+.

Geomagnetic activity should remain Quiet to Unsettled at first, increasing Unsettled to Active later Day 1 and into Day 2, with a slight chance of isolated G1/Minor Storm intervals occurring. Activity should decline through Days 2 and 3 to mainly Quiet, before another increase on Day 4 with a chance of G1 intervals once again.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	20	5	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
*	*	*	*	*	*	*

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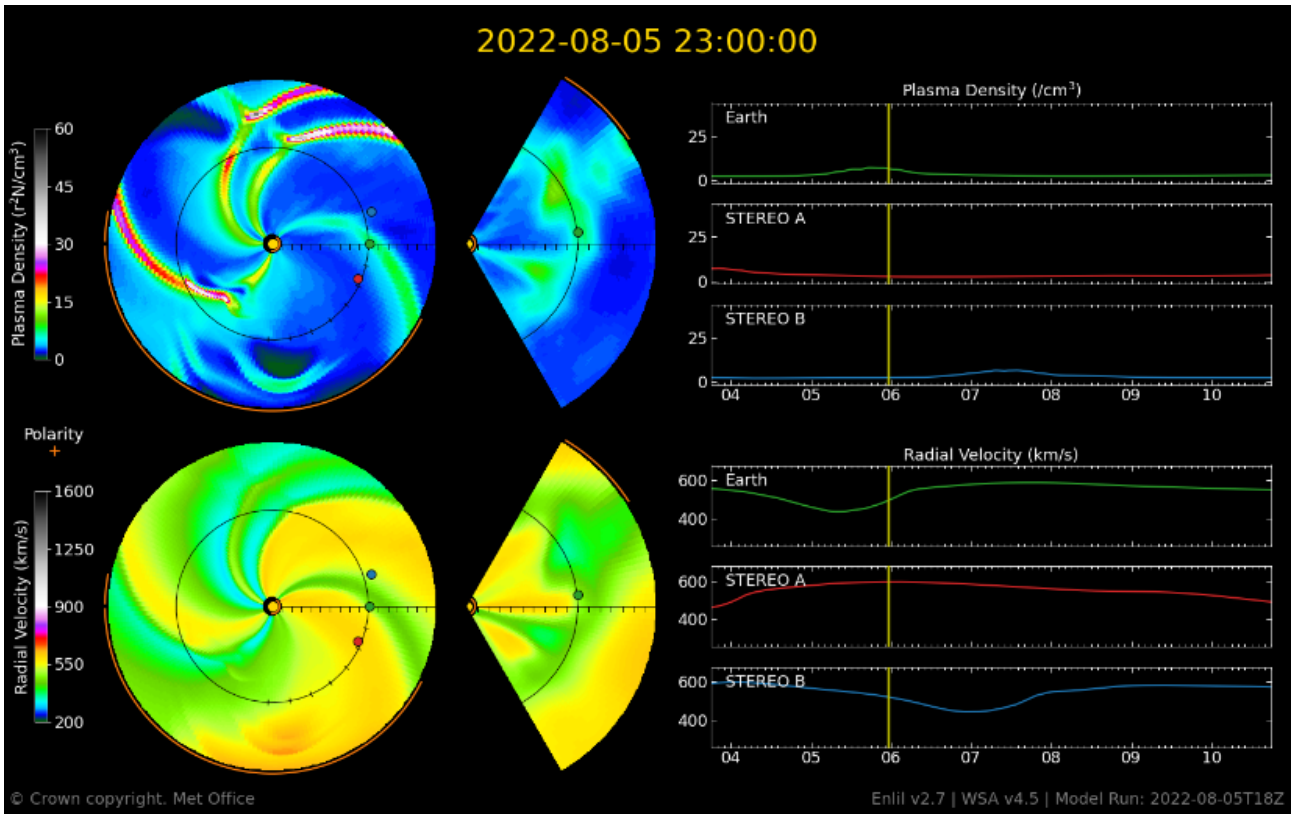
Figure 2: MOSWOC Enlil model showing an increase in wind speeds today and lasting for several days. This may be a little too broad with a decrease likely on Day 3 before a further increase again on Day 4.



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Radio Blackouts - X-Ray Flares:

Solar activity has been Low over the past 24 hours with isolated C-class flares. There are five numbered regions on the disc, most of which currently appear to be weak and magnetically stable. The largest region on the visible disc continues to be AR3068, (now Cao/Beta) which appears largely stable. Two further regions in the southwest quadrant, AR3072 (now Cri/Beta) and AR3073 (Cso/Beta) may have shown some minor activity but appear mostly small and stable. There are also two Hsx/Alpha regions in the southeast.

Low solar activity is likely to continue at first, with a slight chance of an M-class flare. STEREO-A imagery suggests that there are potential new regions due to rotate on in the next couple of days. It is difficult to assess these regions until they become visible, so just a slight increase in flare probability is indicated. However, AR3068 will also rotate off the disc on Day 4 (09 Aug).

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	15	20	25	25
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels and is expected to remain at this level through the period. The spots in the southwest will need monitoring for any further development, however, as the western hemisphere of the solar disc is where radiation events are more likely to connect with Earth.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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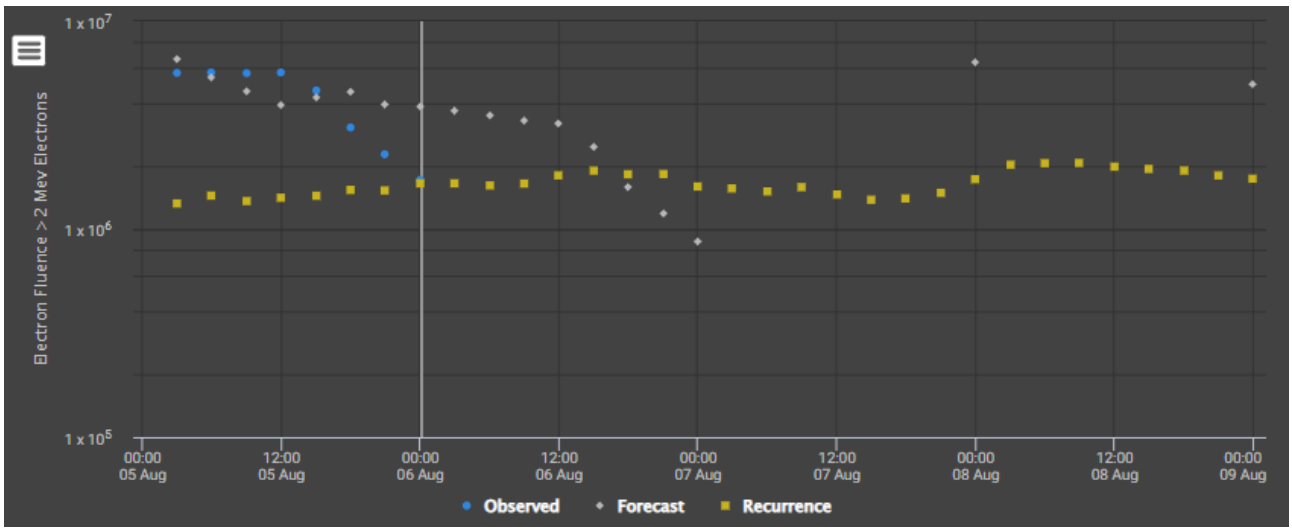
High Energy Electrons Event (≥ 2MeV):
The high energy electron flux (greater than 2 MeV) as measured by GOES-16, is expected to initially be at background levels, but may increase through the period to reach high levels at the diurnal maxima by Days 3 and 4 (08-09 Aug). This is due to a likely increase in wind speeds through Days 1 and 2 from a high speed stream potentially driving some electron charging. The corresponding 24 hour fluence is expected to remain below the Active threshold (1e8 integrated pfu) at first, with an increasing trend possible through Days 3 and 4 and a chance of reaching Active levels at this time.

The Met Office REFM is unlikely to be taking account of the increase in wind speeds early in this period with significant differences from the previous rotation apparent. As such the early part of the period is reasonable, but fluence levels are likely underforecast later in the period.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	10	30	40
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 3: MOSWOC REFM showing a below Active trend. This may be under forecasting fluence levels by Day 3.



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